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Erratum

THROUGHOUT the paper by Travis Winsor and George E. Burch on "The habitus of patients with sickle cell anemia," which appeared in the May, 1944, issue of HUMAN BIOLOGY, the word "drepanocytanemic" was erroneously spelled.

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THE HABITUS OF PATIENTS WITH SICKLE CELL ANEMIA

BY TRAVIS WINSOR, M. D.*
AND
GEORGE E. BURCH, M. D.*

WHILE making certain studies on patients with active sickle cell anemia it was observed that the habitus showed certain trends which were more or less constant in patients with long standing disease. These changes were not obvious in patients exhibiting the sickling phenomenon in the absence of anemia (sicklemia). The habitus in patients with active disease has been noted by others (1), (2), and changes in the external appearance of the skull have also been described (3), (4), (5). To our knowledge, however, there has been no detailed study of the body type in patients with sickle cell anemia or with sicklemia.

The following studies were carried out to determine: (1) if the body build in patients with active sickle cell anemia is peculiar to patients with that disease, (2) if patients with sicklemia exhibit an unusual type of habitus, and (3) some of the factors which may contribute to the patient's bodily configuration.

* From the Department of Medicine, School of Medicine, Tulane University and Charity Hospital of Louisiana, New Orleans, Louisiana.

METHODS AND MATERIALS

Fifteen patients with active sickle cell anemia between the ages of 6 and 32 years and four with sicklemia between the ages of 30 and 47 years were chosen for study. All patients with sickle cell anemia had sickling of the erythrocytes and a positive diagnostic parameter, Δ_1, or Δ_2 (6), (7). Most of the patients with anemia had heart disease (8). The subjects were segregated into 5 age groups, as follows:

Group I. Adult males: Two patients with active sickle cell anemia, ages 21 and 30 years. Controls: Ten normal male subjects of 21 and 10 normal males of 30 years of age.

Group II. Adolescent males: Two patients with active sickle cell anemia, ages 15 and 17 years. Controls: Ten normal male subjects of 15 years and 10 normal males of 17 years.

Group III. Male children: Three males with active sickle cell anemia, one of 7 years and two of 10 years. Controls: Ten normal male subjects of 7 years and 20 normal males of 10 years.

Group IV. Adult females: Four adult female patients with active sickle cell anemia of 21, 24, 30, and 32 years. Controls: Ten normal female subjects of each of the above ages, i. e. 21, 24, 30, and 32 years—a total of 40 subjects. Sicklemia: Four females with sicklemia whose ages were 30, 38, 39, and 47 years.

Group V. Female children: Four female children with active sickle cell anemia, one of 6 years, one of 10 years, and two of 12 years. Controls: Ten normal females of 6 years, ten of 10 years, and 20 of 12 years.

The five groups are shown in Tables 1, 2, 3, and 4. The details of the ages for each group are not represented in the tables. All patients were colored. Most of the patients with sickle cell anemia had been hospitalized repeatedly during periods of acute exacerbations. The male adult and adolescent patients had the most numerous hospital admissions, and as a group represented the most severely diseased subjects. The severity of the disease was less marked in the adult females.

For each patient with sickle cell anemia, 10 control subjects of the same sex, age, and color were chosen for comparison as described in detail above. The control subjects in the older age groups were selected from the personnel of the Charity Hospital at New Orleans. These

patients all received complete physical and laboratory examinations and were average, healthy, American Negroes. The control children were chosen from the St. Katherine Grade School in New Orleans,[1] care being exercised to exclude children showing evidence of congenital syphilis, malnutrition, rickets, or other disease states. These subjects were also healthy American Negroes. Subjects who were very light in color were also excluded. A total of 140 control subjects was studied.

Three methods were utilized to study the habitus: (1) The clinical picture and history were evaluated, (2) photographs and roentgenograms were examined, and (3) anthropometric measurements were recorded and compared.

The measurements were made using standard anthropometric equipment as described by Hrdlička (9). All patients were weighed with shoes and outer clothing removed on a scale accurate to ± 10.0 grams. Photographs (anterior and lateral views) were taken in 14 of the 15 patients with sickle cell anemia.

The physical characteristics of all patients were most readily determined by direct observation of the nude individual. Of the objective methods, the photographic and roentgenographic techniques yielded information of value. However, the patients could only be viewed from a limited number of angles. The anthropometric technique yielded valuable information concerning the skeletal structure of the subject, but was perhaps the least informative method from which to evaluate the general characteristics of the individual as an entity. The shape of the spine, the contour of the chest and abdomen, etc., could not be evaluated objectively using anthropometric instruments. It was felt that by using all three methods *(vide supra)*, each with certain limitations, an accurate evaluation of the general appearance and habitus of the subjects might be obtained.

RESULTS

Clinical picture

The habitus of patients with sickle cell anemia was often striking and at times characteristic. The changes were most marked in the adults in whom sickle cell anemia had been active for many years and least marked in children and in those in whom the disease had been

[1] We are indebted to Father J. E. Modde of the St. Katherine School, 1509 Tulane Avenue, New Orleans, for his kind assistance in the measuring of these children.

manifest for only a short period of time. The habitus of the typical patient was as follows: In the *adults* with sickle cell anemia the height and weight were less than normal. The trunk appeared short and the legs long. The head was elongated (dolichocephaly), or tall (scaphocephaly) in an occasional patient. In patients with severe disease the neck appeared short and the head heavy. The normal spinal curvatures were accentuated producing marked kyphosis and lordosis. The shoulders and hips were narrow and occasionally the shoulders were held high with an apparent immobility of these parts. The arms appeared long and the finger tips frequently almost touched the knees with the patient in the erect position. The hands were long and slender and may well be termed "spider hands". The feet shared in the quality of elongation, but to a lesser degree than did the hands. The long thin fingers frequently tapered moderately at the finger tips. The skin of the finger tips on both the dorsal and volar surfaces was somewhat atrophic. No ulceration of the finger tips was encountered. The nails were "parrot-beaked" in an occasional patient and Beau's lines were rarely present. Frank clubbing and cyanosis were seen rarely. In general, these patients appeared delicate and frail and lacked muscular development and subcutaneous tissue.

In the *children* the chest was sometimes deep ("hoop chest") and the abdomen often protruded sharply and markedly at the ziphoid process. The arms and legs were thin and stood out in sharp contrast to the abdominal enlargement.

The habitus in patients with *sicklemia* was not abnormal.

In addition to the alteration in the bony structure and somatic tissues of the body the majority of adult patients with active sickle cell disease showed some evidence of gonadal hypofunction. Six of the eight adult patients with sickle cell anemia showed some degree of malfunction or malformation of the genital tract. Diminution in the amount and distribution of facial, axillary, thoracic, and pubic hair occurred in 75 per cent of the males in the older age groups. There was loss of libido in 2 and atrophy of the testes in 1 of these patients. Of the 4 females with sickle cell anemia, 3 had a history of absolute or relative sterility. The breast development was not abnormal in any patient. Evidence of hypogonadism was not encountered in patients with *sicklemia*.

Photographic and roentgenographic study

Photographs of subjects with sickle cell anemia confirmed the observations noted on clinical examination. The linear build, emaciation,

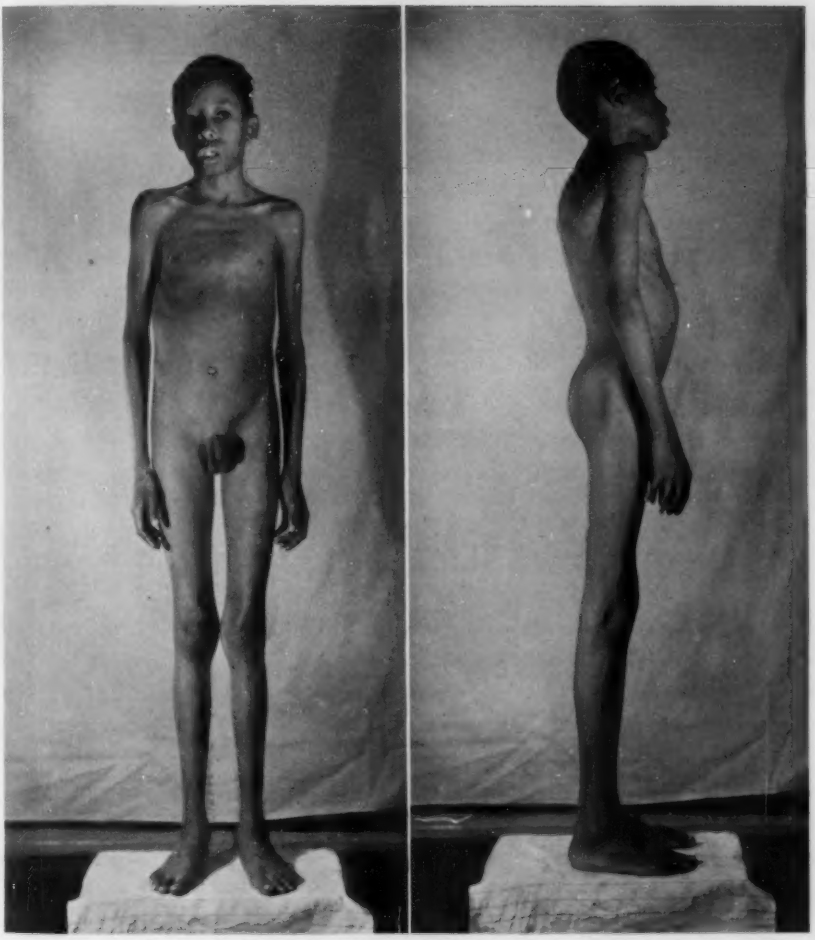

FIG. 1, A AND B. ADOLESCENT BOY, SHOWING THE EFFECTS OF SICKLE CELL ANEMIA

This 17-year-old adolescent, shown in two views, demonstrates the linear type of habitus, the emaciation, the long extremities, the short trunk, the upper dorsal kyphosis, the "hoop chest," the protuberant abdomen, and the genital infantilism and lack of pubic hair. The bone age is not abnormal.

long legs, short trunk, "spider hands", kyphosis, lordosis, deep chest ("hoop chest"), enlarged abdomen, thin legs, and hypogonadal tendencies are shown in Figure 1, A and B. The patients with sicklemia showed no deviation in habitus from the normal.

Roentgenograms of the hands were taken in 4 patients. In 3 the metacarpals and phalanges appeared narrow and of increased length ("spider fingers"). Comparable changes were seen in the bones of the feet. X-rays of the skull were taken in 4 patients and in one the anteroposterior diameter was slightly increased. In 5 patients, X-rays of the lumbar or cervical spine were made. In only one was there any gross change in the appearance of the vertebral bodies. In this patient, there were crescentic defects along the superior and inferior surfaces with a flattening of the vertebral bodies. This patient was 21 years of age and complained of severe backache. The bone ages were studied in 5 patients (2 were adults) and all were found within normal limits.

Anthropometric measurements

The physical measurements confirm the direct observations and the photographic and roentgenographic findings. The anthropometric measurements are summarized in Tables 1, 2, 3, and 4. As the physical characteristics of patients with sicklemia did not show any significant deviation from the normal, the comparisons of the results presented below were made between the normal subjects and patients with sickle cell anemia.

The *average stature* for the adult and adolescent males and for the female children was less than that for the normal subjects, while for the adult females, it was greater than the normal. The stature of the male adolescents averaged 11.4 centimeters less than the controls, while that of the male children did not deviate significantly from the normal. The average *weight* of the diseased patients of all groups except the children was less than the normal. In the adult males the weight averaged 70.5 per cent of normal and in the adolescent males, it averaged 73.2 per cent. A comparison of the weight and the stature showed that although both stature and weight were reduced, the reduction in weight was greater than the reduction in stature. In the adult males the weight to height index averaged 25.6 as compared to 35.5 in the normals. In all of the diseased patients except the female children the *sitting height* was short, as compared to the stature, to the pubic height (floor to the superior portion of the symphysis pubis), or to the span.

TABLE 1

Anthropometric measurements (centimeters) of the trunk and extremities of patients with sickle cell anemia and sicklemia
The columns for each group represent mean, maximum, and minimum values in this table and in the tables to follow.

	MALES						FEMALES				
	Adults		Adolescents		Children		Adults			Children	
	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	Sicklemia	S.C.A.	Controls
	168.2	171.8	154.7	166.1	126.8	126.8	165.0	160.1	161.9	115.0	127.5
Stature	171.0	177.0	163.5	181.0	133.0	138.7	167.7	176.2	164.5	123.2	145.1
	165.5	160.3	146.0	157.0	123.5	114.0	158.0	152.2	157.4	106.8	111.8
	43.0	61.0	38.0	51.9	24.8	23.4	51.5	62.6	82.9	31.5	24.4
Weight	45.0	79.5	49.0	70.0	27.0	28.0	54.5	85.6	91.0	33.0	35.0
	41.0	51.2	27.0	43.0	22.5	18.0	47.6	52.0	62.0	30.0	15.5
	178.2	182.4	163.7	177.2	134.7	130.5	172.0	171.3	170.2	123.4	131.8
Span	181.0	190.5	176.0	189.0	138.0	145.4	175.0	182.0	175.8	137.4	154.2
	175.5	169.0	151.5	166.0	129.0	117.0	169.0	160.0	166.8	109.5	112.1
	79.4	87.6	74.2	84.4	65.4	67.8	79.0	80.6	83.9	61.5	67.3
Sitting height	81.2	91.0	78.5	89.0	69.2	73.0	83.0	87.3	85.6	65.6	75.5
	77.7	82.8	70.0	78.3	62.0	61.5	74.0	78.6	83.0	57.6	59.7
	94.0	91.6	85.0	89.7	67.0	62.9	..	..	..	59.7	66.7
Pubic height	97.0	97.0	89.6	98.8	69.6	73.8	..	..	..	69.5	76.2
	91.0	82.2	80.5	83.5	62.8	57.2	..	..	..	50.0	54.8

	MALES						FEMALES				
	Adults		Adolescents		Children		Adults			Children	
	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	Sicklemia	S.C.A.	Controls
INDICES											
	47.2	51.0	47.9	50.8	51.6	53.5	47.9	50.3	51.8	53.5	52.8
Sitting height / Stature	47.5 / 46.9	51.4 / 51.6	48.0 / 47.9	49.2 / 49.8	52.0 / 50,2	52.6 / 53.9	49.5 / 46.8	49.5 / 51.6	52.0 / 52.7	53.2 / 53.8	52.0 / 53.4
	25.6	35.5	24.6	31.2	19.5	18.4	31.2	39.1	51.2	27.4	19.1
Weight / Height	26.3 / 24.8	44.8 / 31.9	30.0 / 18.5	38.7 / 27.4	20.3 / 18.2	20.2 / 15.8	32.5 / 30.1	48.6 / 34.2	55.3 / 39.4	26.8 / 28.1	24.1 / 13.9
	105.9	106.2	105.8	106.7	106.2	103.0	104.2	107.0	105.1	107.3	103.4
Span / Stature	105.8 / 106.0	107.6 / 105.4	107.6 / 103.7	104.4 / 105.7	103.7 / 104.4	104.8 / 102.6	104.3 / 106.9	103.2 / 105.1	106.9 / 105.9	111.5 / 102.5	106.3 / 100.3
	55.9	53.3	54.9	54.0	52.8	49.6	..	..	..	51.9	52.3
Pubic height / Stature	56.7 / 55.0	54.8 / 51.3	54.8 / 55.1	54.6 / 53.2	52.3 / 50.8	53.2 / 50.2	..	..	..	56.4 / 46.8	52.5 / 49.0
	44.5	48.0	45.3	47.6	48.5	52.0	45.9	47.0	49.3	49.8	51.1
Sitting height / Span	44.9 / 44.3	47.8 / 49.0	44.6 / 46.2	47.1 / 47.2	50.1 / 48.1	50.2 / 52.6	47.4 / 43.8	48.0 / 49.1	48.7 / 49.8	47.7 / 52.6	49.0 / 53.2
	84.5	95.6	87.3	94.1	97.6	107.8	..	..	..	103.0	100.9
Sitting height / Pubic height	83.7 / 85.4	93.8 / 100.7	87.6 / 86.9	90.1 / 93.8	99.4 / 98.7	98.9 / 107.5	..	..	..	94.4 / 115.2	99.1 / 108.9

TABLE 2

Anthropometric measurements (centimeters) of the head of patients with sicklemia and sickle cell anemia

	MALES						FEMALES				
	Adults		Adolescents		Children		Adults			Children	
	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	Sicklemia	S.C.A.	Controls
	18.8	19.3	19.7	18.8	18.5	17.5	18.4	18.7	19.2	17.3	17.5
Length	19.2	20.4	20.5	20.1	19.0	19.1	19.0	19.8	20.1	17.7	18.8
	18.4	18.6	19.0	17.2	17.7	14.4	18.4	16.7	18.0	17.0	16.6
	14.3	14.8	13.9	14.5	13.9	13.8	14.1	14.5	14.6	13.0	13.7
Width	14.5	15.7	14.9	15.3	14.1	14.3	15.5	15.2	14.7	13.0	14.5
	14.2	13.5	13.0	13.5	13.5	13.2	13.0	13.5	14.5	13.0	12.5
	12.3	13.0	13.1	12.4	12.5	11.9	12.4	12.5	12.2	12.3	11.8
Height	12.6	14.2	14.0	14.7	13.6	12.6	12.8	14.5	13.7	12.5	13.2
	12.0	12.0	12.2	12.0	11.0	16.0	12.1	11.5	10.8	12.2	10.7
	53.5	55.5	53.6	54.1	52.2	50.8	54.2	55.0	58.3	51.4	51.5
Girth	54.6	58.5	57.2	56.4	53.8	53.4	55.3	58.4	63.5	54.6	55.1
	52.8	52.6	50.0	51.8	50.8	48.6	53.4	49.6	53.2	48.3	48.7
INDICES:											
Width	76.1	76.7	70.5	77.1	75.1	78.9	76.6	77.5	76.0	75.1	78.3
Length	75.5	76.9	72.7	76.1	74.2	74.9	81.6	76.7	73.1	73.4	77.1
	77.2	72.5	68.4	78.5	76.3	91.7	70.6	80.8	80.5	76.5	75.3
Height	74.5	76.2	78.0	74.7	77.2	76.3	76.5	75.3	72.1	81.4	75.6
Mean of length	75.0	78.9	79.1	83.0	82.2	75.4	74.4	82.8	78.7	81.7	79.5
and width	73.6	75.0	76.2	78.4	73.1	79.7	77.1	76.1	66.6	81.3	73.8
Leg girth	41.3	58.5	42.7	59.8	32.9	45.5	57.6	66.7	62.3	42.6	47.4
Head girth	46.5	62.5	40.0	61.3	38.8	48.5	58.4	70.3	64.2	45.4	51.2
	41.3	58.0	45.8	54.0	30.3	42.4	55.2	65.1	65.8	39.5	41.5

In the adolescent males the reduction in the sitting height was marked and the increase in the pubic height was moderate. In the adult males, the sitting height averaged 47.2 per cent of the stature and in the normal subjects it averaged 51.0 per cent. The *cranial measurements* revealed the presence of dolichocephaly in 2 adolescent males. The average cephalic index for these patients was 70.5 as compared to an average index for the controls of 77.1. There was a slight tendency toward scaphocephaly in the female children in whom the mean height of the head as compared to the length and width was 81.4, in contrast to the control group which averaged 75.6. In all of the other groups, however, no abnormal skull changes were seen. In all patients the greatest *girth of the leg* (calf) was less than that encountered in the controls. The greatest decrease in girth was seen in the male adults and adolescents in whom the average girths were 68.0 per cent and 71.2 per cent of the normal. The female children showed the least change from the normal, the girth being 89.9 per cent of normal. The male adults and adolescents had *shoulders* which were narrower than normal. In the children the *anteroposterior diameter of the chest* was absolutely and relatively increased. In all diseased groups the anteroposterior diameter was increased considerably over the transverse diameter. This "hoop" type of chest occurred as frequently in the adults as it did in the children. In the male children the depth of the chest was 77.9 per cent of the width, while in the controls it was 68.9 per cent. The *girth of the chest* and the ratio of chest girth to stature was less in the adults and greater in the children than normal. In all patients the *abdominal girth* was large, as compared to the girth of the chest. The adolescent males presented abdominal girths which were 92.2 per cent of the chest girth while in the normals it was 86.1 per cent. In all patients the hands and feet were narrow and long. In the adult females the width of the hand averaged 40.8 per cent of the length as compared to 44.8 per cent in the normal.

Head girth	41.3	58.0	45.8	54.0	30.3	42.4	55.2	65.1	65.8	39.5	41.5

DISCUSSION

It can be seen from these studies that patients with severe active sickle cell anemia of long duration, present a rather characteristic habitus, which is not primary, but secondary to the disease. It can develop at any stage of life, and not inconceivably in utero. This habitus is unlike the so-called "peptic ulcer build" or the "poliomyelitis physiognomy". In these, the habitus is said to be genetic in origin and indicates a "con-

TABLE 3

Anthropometric measurements (centimeters) of the trunk of patients with sicklemia and sickle cell anemia

	MALES						FEMALES				
	Adults		Adolescents		Children		Adults			Children	
	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	Sicklemia	S.C.A.	Controls
	36.5	41.0	35.0	38.3	29.1	29.6	36.2	37.7	38.5	29.0	28.3
Shoulder:	38.8	44.6	38.0	43.4	30.0	32.6	38.4	41.3	40.5	33.2	33.5
Width	34.3	37.3	32.0	37.0	28.0	26.4	34.2	35.0	34.2	24.2	24.7
Chest:	18.6	19.0	17.9	17.9	15.9	13.5	18.2	18.6	19.2	15.0	13.4
Antero-pos-	19.0	21.9	19.9	19.8	16.4	14.6	20.0	23.8	21.0	16.0	15.2
terior	18.2	17.2	16.0	16.3	15.6	12.6	16.7	17.2	17.4	14.0	12.0
	24.0	28.3	24.3	26.0	20.4	19.6	23.9	26.8	30.4	18.9	19.0
Lateral	26.0	31.7	26.6	29.1	21.3	20.5	25.6	32.8	34.0	20.1	22.3
	22.0	24.4	22.0	22.8	19.2	18.5	23.0	24.4	28.9	17.8	16.2
	72.5	86.3	72.3	77.6	61.0	57.0	72.0	85.2	88.9	57.1	56.6
Circumference	75.0	97.3	78.6	90.0	62.4	61.5	77.5	101.5	96.4	61.0	64.5
	71.1	78.8	76.2	69.1	58.4	53.5	62.5	78.6	83.7	53.3	47.3
	63.3	72.1	66.7	66.8	56.5	52.1	68.3	75.6	82.9	52.7	51.4
Abdomen:	63.6	86.5	72.4	72.5	58.9	57.2	76.2	101.5	91.4	57.2	59.6
Circumference	63.0	68.1	61.0	61.8	54.6	46.5	58.4	64.1	73.6	48.3	43.2
	24.6	27.4	22.8	25.5	19.8	19.0	24.8	27.9	30.0	18.6	19.2
Pelvis:	24.7	30.0	24.6	28.2	20.7	21.6	26.0	31.0	35.0	20.3	22.1
Intercristal	24.6	25.6	21.1	22.4	18.5	17.5	24.0	25.8	26.3	17.0	17.0

	MALES						FEMALES				
	Adults		Adolescents		Children		Adults			Children	
	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	Sicklemia	S.C.A.	Controls
INDICES											
Chest girth / Stature	43.1	50.2	46.7	46.7	48.1	44.9	43.6	53.2	54.9	49.6	44.4
	43.8	55.0	48.1	49.7	46.9	44.3	46.2	57.6	58.6	49.5	44.5
	43.0	49.1	52.2	44.0	47.3	46.9	39.5	51.6	53.2	49.9	42.3
Anteroposterier of chest / Lat. of chest	77.5	67.1	73.6	68.8	77.9	68.9	76.1	69.4	63.1	79.4	70.5
	73.1	69.1	74.8	68.0	77.0	71.2	78.1	72.6	61.8	79.6	68.2
	82.7	70.5	72.7	71.5	81.2	68.1	72.6	70.5	60.2	78.6	74.1
Intercristal / Shoulder breadth	67.4	66.8	65.1	66.6	68.0	64.2	68.5	74.0	77.9	64.1	67.8
	63.6	67.3	64.7	65.0	69.0	66.3	67.7	75.1	86.4	61.1	66.0
	71.7	68.6	65.9	60.6	66.1	66.3	70.2	73.7	79.9	70.2	68.8
Intercristal / Stature	14.6	15.9	14.7	15.3	15.6	15.0	15.0	17.4	18.5	16.2	15.0
	14.4	16.9	15.0	15.6	15.6	15.6	15.5	17.6	21.3	16.5	15.2
	14.9	15.0	14.5	14.3	15.0	15.3	15.2	16.9	16.7	15.9	15.2
Shoulder width / Abdominal girth	57.7	56.9	52.5	57.3	51.5	56.8	53.0	49.9	46.4	55.0	55.1
	61.0	51.6	52.5	59.9	51.0	57.0	50.4	40.7	44.3	58.0	56.2
	54.4	54.8	52.5	59.9	51.3	56.8	58.6	54.6	46.5	50.1	57.2
Abdominal girth / Chest girth	87.3	83.5	92.2	86.1	92.6	91.4	94.9	88.7	93.2	92.3	90.8
	84.8	88.9	92.1	80.6	94.4	93.0	98.3	100.0	94.8	93.7	92.4
	88.6	86.4	80.1	89.4	93.5	86.9	93.4	81.6	87.9	90.6	91.3

TABLE 4

Anthropometric measurements (centimeters) of the acral portions of the body of patients with sicklemia and sickle cell anemia

	MALES						FEMALES				
	Adults		Adolescents		Children		Adults			Children	
	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	S.C.A.	Controls	Sicklemia	S.C.A.	Controls
Hand:	19.2	19.9	17.4	19.6	14.5	14.5	19.1	18.5	18.5	13.7	14.4
Length	20.3	22.0	18.6	21.1	15.4	15.9	19.5	19.8	19.2	15.1	16.1
	18.1	18.4	16.3	18.4	13.1	13.3	18.8	17.6	17.8	12.3	13.9
	8.0	9.0	7.7	9.1	6.7	7.0	7.8	8.3	8.5	6.0	6.5
Breadth	8.3	9.7	8.5	10.0	7.0	7.9	8.5	9.5	8.8	6.5	7.1
	7.8	8.4	7.0	8.1	6.5	6.5	6.8	7.3	8.3	5.5	6.0
Index, $\frac{B}{L}$ *	41.7	45.2	44.2	46.4	46.2	48.3	40.8	44.8	45.9	43.8	45.1
	40.8	44.1	45.7	47.4	45.4	49.7	43.6	48.0	45.8	43.1	44.1
	43.1	45.6	42.9	44.0	49.6	48.9	36.2	41.5	46.6	44.7	43.2
Foot:	25.9	26.6	24.8	26.7	21.0	20.4	24.8	24.4	24.5	21.1	20.5
Length	27.0	28.1	26.3	29.4	22.0	22.4	25.7	26.3	24.5		23.8
	26.3	25.0	23.4	24.4	20.0	18.2	24.1	23.3	24.5		17.9
	9.5	10.1	8.8	10.0	8.1	7.9	9.4	9.3	9.7	7.5	7.9
Breadth	10.0	11.6	9.3	11.3	8.6	8.8	10.1	11.0	10.3		9.0
	9.0	9.3	8.3	9.2	7.7	7.0	8.8	8.5	9.1		7.1
Index, $\frac{B}{L}$	36.7	38.0	35.5	37.4	38.6	38.7	37.9	38.1	39.6	35.5	38.5
	37.0	41.3	35.4	38.4	39.1	39.3	39.3	41.8	42.0		37.8
	34.2	37.2	35.5	37.7	38.5	38.5	36.5	36.4	37.1		39.7
Leg:	22.1	32.5	22.9	32.2	17.2	23.1	31.2	36.7	36.3	21.9	24.4
Circum-	25.4	36.6	22.9	34.6	20.9	25.9	32.3	41.1	40.8	24.8	28.2
ference	21.8	30.5	22.9	28.0	15.4	20.6	29.5	32.3	35.0	19.1	20.2

* $\frac{B}{L}$ = Breadth over length

stitutional" predisposition to peptic ulcer, or acute poliomyelitis. This is not the case in sickle cell anemia. It is impossible to predict a tendency to the disease on the basis of habitus alone, even though sickle cell anemia appears to be closely allied to genetic processes. One may say that the habitus in sickle cell anemia occurs because of the activity of the disease rather than that the disease is more likely to develop because of a certain habitus.

The essential features of the syndrome constituting the "depranocytanemic habitus" are as follows (for details consult the results): In the *adult* there is a linear build, emaciation, long legs, a short trunk, "spider hands", marked kyphosis and lordosis, or "hoop chest", a tendency to hypogonadism, and a general appearance of fragility. The *child* presents a deep and narrow chest ("hoop chest"), an enlarged, protruding abdomen, a short trunk, and long thin legs.

Changes in the skull have been described by others (10), (11), (12), and include scaphocephaly (13), dolichocephaly (3), and macrocephaly (14). None of these changes appears to be typical, as such changes have been described for other abnormal states, viz., Cooley's anemia and congenital hemolytic anemia (2), (15). The roentgenographic findings in the skull or other bones for that matter are probably nonspecific.

At this point it is wise to draw attention to a few physical characteristics of the normal American Negro which may be compared with patients exhibiting the depranocytanemic habitus (16), (17), (18), (19), (20), (21), (22), (23), (24), (25). The American Negro tends to be linear in build, his trunk is relatively short and his pelvis and hands narrow. There may be an overlapping of individual measurements of the normal American Negro with comparable ones in patients with the "depranocytanemic habitus", but when all measurements are considered as a unit or syndrome, a quantitative and qualitative difference *(vide supra)* is noted between the normal and diseased subjects.

The American Negro when compared with the American white is found to show a normal tendency to simulate the "depranocytanemic habitus syndrome" (26), (27), (28), (29), (30). The linear build, short trunk, long legs, and lumbar lordosis of the normal Negro have been described above. It is well to keep this in mind when considering the problems of the patient with sickle cell anemia.

* $\frac{B}{L}$ = Breadth over length

The physical characteristics of patients with depranocytic anemia also may, at a glance, be found to resemble those seen in patients with primary hypogonadism. On closer study, however, these individuals are found to be quite different. The patient with hypogonadism is taller than normal, his span is greater than normal, and there is a marked delay in the maturing of bones. These characteristics are not usually found in the subjects with the "depranocytanemic habitus syndrome". There are many other differences between these two groups.

The mechanisms involved in the production of the "depranocytanemic habitus syndrome" can only be conjectured. There is no doubt that many factors contribute to the development of the habitus. Among these are the anemia, the cardiovascular disease, the endocrine dysfunction, and the dysfunction of the entire visceral and central nervous systems. All of these factors contribute at least secondarily in the moulding of the final habitus. It is because of these factors which are continuously functioning in individuals with active sickle cell anemia that the habitus is dynamic and not static. It is also because of the progressive nature of the change in habitus that there can be such variations among patients suffering from this disease. Therefore, the habitus as described above indicates the trend of this change as seen in subjects with active sickle cell anemia.

SUMMARY

The habitus was studied in 15 patients with sickle cell anemia and in 4 with sicklemia. The body type in patients with sickle cell anemia is probably the result of the disease processes themselves and is not dependent upon genetic characteristics. The essential features of the "depranocytanemic habitus" are as follows: In the *adult* there is a linear build, emaciation, long legs, a short trunk, increased dorsal kyphosis, and lumbar lordosis, a "hoop chest", and "spider fingers". In the *child* there is a deep narrow chest, an enlarged abdomen and long thin extremities. The skull is only rarely abnormally shaped. The factors which influence the body type are the degree and duration of the anemia, the changes in the endocrine system, particularly the gonads, alteration of the osseous system as seen in the flattening of the vertebral bodies of the lumbar spine, cardiac disease, and peripheral vascular disease. Patients with sicklemia showed no significant deviations from the control subjects.

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EVALUATION OF THE CANCER EDUCATIONAL PROGRAM IN MASSACHUSETTS

BY HERBERT L. LOMBARD, M. D., MILDRED R. TULLY, AND EVELYN A. POTTER

Division of Adult Hygiene, Massachusetts Department of Public Health

THE recognition of cancer as a public health problem resulted first in programs aimed at its control, and later in appraisals of the value of these programs. The most important appraisal, before comprehensive governmental programs were established, was the *Report of the Commission on Cancer of the Medical Society of the State of Pennsylvania* in 1924 (1). This Commission stated as its purpose, " . . . to learn if possible, first; Does cancer education pay?—and also to learn how previous efforts could be improved upon." Comparing the time which elapsed between the onset of symptoms and the institution of treatment for cancer patients in 1910 and 1923, the Commission gave an affirmative answer to the question regarding the value of cancer education, and suggested that a cancer division be added to the "state health department clinics" to further the improvement in reduction of the period of delay.

Less than two years after publication of the Pennsylvania Report a cancer program was inaugurated in Massachusetts (2), and a few years later it was followed by programs elsewhere, under state or Federal control (3). These programs were based on the composite opinions of public health administrators, statisticians, surgeons, radiologists, and pathologists. The ideas of Bloodgood (4), Greenough (5, 7), and Ewing (6, 7) were combined with those of Hoffman (8), Chapin (9), Rankin (9), and their followers (10, 11). Appraisal of results was accepted as a part of a program for cancer control (9). At the present time, every cancer program is attempting some form of evaluation.

The ease of the laboratory experiment is not duplicated in studying the value of educational efforts. Geographic boundaries do not limit the effect of education. The Massachusetts program has inspired action

beyond the confines of the State, and the excellent work done in other localities has, in turn, been felt in Massachusetts. Moreover, the scope of education in cancer adds to the complexity of the problem. No one would question that a lecture on cancer to a lay audience, or a pamphlet prepared for public distribution, were forms of education. On the other hand, there would be a difference of opinion as to whether the mere presence of a cancer clinic could be considered educational. Some would argue in the affirmative, others would deny this emphatically. Many individuals would be even more liberal with their definition and claim that the entire cancer program was one of education, and that the clinical activities were mere adjuncts. If one makes such an assumption the definition has been broadened, and to a certain extent difficulties of evaluation have decreased.

Appraisals may be of two types: one, the broad form which attempts to measure the value of a complete program; the other, a more detailed study which selects the parts of a program for measurement. In an address before the Massachusetts Association of Boards of Health, in 1913, Dr. Chapin (12) stated, "Educational work ought to yield great returns for the money. Lectures, exhibitions, moving pictures, leaflets, bulletins, and press articles are all useful. Their relative effectiveness should be studied, just as an up-to-date business man studies advertising." If this type of analysis is to be used, the problem of plural variables arises. The individual may remember that cancer was discussed in his newspaper, he may have heard a talk on the radio, and on some occasion may have attended a lecture on the subject. The exact source of his information may be unknown and the necessity of separating the effect of plural variables becomes apparent.

The primary objective of this study was to determine the relative value of educational media. A second objective was to obtain a norm of cancer knowledge for comparison with later studies. The information desired was the existing knowledge of cancer in the population, together with the sources of this knowledge.

The method of obtaining the information was a house-to-house survey in three communities, utilizing the following questionnaire:

1. What is your opinion on the curability of cancer?
2. What is your opinion on the cause of cancer?
3. What is your opinion on pain as an early symptom?

4. What is your opinion as to whether cancer starts as a generalized or a localized disease?
5. In your opinion is cancer contagious?
6. Have you heard any lectures on cancer?
7. Have you read any cancer articles in magazines? Name the magazines.
8. Have you read about cancer in the newspapers?
9. Have you heard any cancer talks on the radio?
10. Have you learned about cancer from any other sources?

The cities chosen for the survey were Lynn and Somerville, with populations of about 100,000 each, and Malden with a population of approximately 60,000. These cities are all part of Metropolitan Boston. Approximately 13 per cent of the families in Lynn and Somerville were surveyed, and 8 per cent of those in Malden. The amount of educational work which had been carried on in these cities differed. Lynn has had an active cancer clinic for sixteen years and a Cooperative Cancer Control Committee for eight years. At the present time, under the auspices of this committee, an extensive program is being planned for the high schools. Somerville was chosen because it is one of the few communities in the State which has not yet organized a Cooperative Cancer Control Committee. Malden was chosen since it is a city which has had more cancer education than Somerville, and less than Lynn. A Cooperative Cancer Control Committee was not organized in Malden until the spring of 1942 but the committee has been active and has sponsored a school program in addition to the regular lectures on cancer. Each city was divided into several districts of about equal population. Approximately the same number of families, well distributed, were interviewed in each district. Only one record was obtained from a family. In a few instances this caused considerable difficulty as several members of a family desired to be recorded and their opinions were sometimes diverse.

It was necessary to divide the records into two groups. In the first, were placed individuals having a good knowledge of cancer; in the second, those who did not. The examination of the records indicated that all of the five questions intended for measuring cancer knowledge could not be used. The answers to the question on causation were ex-

tremely interesting but, in many cases, were difficult to interpret. An individual might inform the surveyor that cancer was caused from the hair of a yellow cat, and from the ingestion of arsenic. With half the answer correct, how should this be scored? Some answered this question on causation by "do not know". This could be interpreted in two ways: either that the actual cause of cancer is unknown, or that the individual himself did not know the cause of cancer, although others might. The most frequent cause mentioned was a blow or injury, but evidently there was confusion between the single blow and long-continued chronic irritation.

The question as to whether cancer is a general or a localized disease was not understood by many individuals. The surveyors attempted to explain it and the resulting high score suggested that leading information probably had been given.

The remaining three questions on curability, contagion, and pain were used as a measure of the individual's knowledge of cancer.

All three questions were correctly answered by 23.5 per cent of the total population surveyed. At least two questions were answered correctly by 56.3 per cent, and at least one question correctly by 87.1 per cent. The remaining 12.9 per cent of the population answered none of them correctly. In the three cities there were differences in the percentages of individuals with a knowledge of cancer which would correspond to the amount of cancer education. Lynn led, with Malden second, and Somerville third (Table 1).

The Gallup Poll (13) and the Nassau County Cancer Committee (14),

TABLE 1

Percentage of individuals who answered correctly three, two, one or none of the questions measuring the knowledge of cancer

	THREE CORRECT	TWO CORRECT	ONE CORRECT	NONE CORRECT
Lynn	25.7	36.8	26.1	11.4
Malden	23.6	36.8	29.5	10.0
Somerville	21.2	27.3	36.0	15.6
Total	23.5	32.8	30.8	12.9

in their surveys of cancer knowledge in samples of the population, have studied two of these questions, namely, curability and contagion.

The sources of information regarding cancer are shown in Table 2. For the combined survey it was felt that any relationship existing between the amount of knowledge and the given sources of information would be more satisfactorily answered by combining the records for all three cities, as this would increase the number of records without detracting from the value of the results. The largest single source of knowledge was the newspaper, which was closely followed by the magazine. About one half of the surveyed population reported information from each of these sources. Individuals whose knowledge was obtained from contact, direct or indirect, with the disease comprised nearly one third of the surveyed population. The contact was obtained by the individual either having had the disease, having cared for patients with the disease, or having had friends or relatives with the disease. About one quarter of those interviewed had learned about cancer from the radio. Only small percentages reported other sources of information. Slightly over one fifth reported none of these sources, but knew the answer to at least one question, while only 2.2 per cent of those furnishing no source of information could answer all three questions. Whether this latter group obtained its information from one of these sources but had forgotten it, or was able to answer the question by guesswork, is problematical.

Multiple sources of knowledge were frequent, and in order to arrive at conclusions regarding their respective values, it was necessary to resort to partial correlation. The term "good score" was applied to the records on which the answers to all three questions were correct. "Poor score" was given to the records on which none of the questions were answered correctly. This necessitated the elimination of a large number of records, and was felt to be better than some arbitrary division of all the records.

There is no generally accepted measure of correlation which can be used with assurance for calculating partial correlation coefficients for the 2 x 2 table. A variety of methods of approach were used in seeking the best methodology. The product-moment correlation coefficient for a 2 x 2 table, discussed by Yule and Kendall (15), seemed to be the least unsatisfactory of all the approaches and has therefore been used.

Correlation coefficients were computed for "good score" and "reading material", "the spoken word", "contact with cancer" and "visual

TABLE 2

Sources of information regarding cancer

	PERCENTAGE OF TOTAL POPULATION	
Reading	65.6	
Magazines		46.0
Newspapers		57.4
Books		3.6
Pamphlets		5.3
Insurance company advertisements		0.9
Spoken word	31.6	
Lectures		7.4
Radio		25.7
Physicians		3.7
Visual aids	3.5	
Train posters		2.3
Exhibits		0.1
Movies		0.6
Knowledge of cancer from contact	30.4	
None of the above variables	21.1	
None of the above variables and answered none of the questions	6.1	
None of the above but knew the answer to at least one question	15.0	
None of the above but knew the answers to all three questions	2.2	

Total population surveyed 6966

aids". Partial coefficients were calculated and then transformed into *z*. This analysis showed that all the partial coefficients were significant and that "reading material" was of far greater value than any of the other variables as a source of information. The "spoken word" and "contact with cancer" did not differ significantly from one another. They exceeded "visual aids" (Table 3).

TABLE 3

Relative value of sources of cancer information as determined by partial correlation

	r (ZERO ORDER)	PARTIAL r OTHER VARIABLES CONSTANT	PARTIAL z	STANDARD ERROR OF z
Broad groupings				
Reading material	.449	.407	.432	.0199
Spoken word	.215	.116	.117	.0199
Contact with cancer	.163	.113	.114	.0199
Visual aids	.084	.047	.047	.0199
Eight sources				
Magazines	.385	.246	.251	.0199
Newspapers	.368	.200	.203	.0199
Contact with cancer	.163	.115	.116	.0199
Books and/or pamphlets	.157	.074	.074	.0199
Radio	.166	.071	.071	.0199
Physicians	.100	.0591	.0591	.0199
Lectures	.136	.0589	.0589	.0199
Visual aids	.084	.050	.050	.0199

A further analysis was attempted by subdividing "reading material" and "spoken word", furnishing eight sources rather than the original four. The number of individuals reporting knowledge derived from "visual aids" were so few that subdivisions were not attempted. "Books" were grouped with "pamphlets", and the few reporting "insurance company advertisements" were omitted. The eight resulting variables, "magazines", "newspapers", "books and/or pamphlets", "lectures", "radio", "physicians", "visual aids" and "contact with cancer" have been analyzed by partial correlation to determine the relationship of each with knowledge of cancer, and with each other, with all the other variables held constant. All of these variables were significant and are of value in furnishing cancer information.

"Magazines" headed the list, with "newspapers" second, although there was no statistical difference between these two variables. "Contact with cancer" followed. This differed significantly from all the

variables, with the exception of "books and/or pamphlets" and "radio", if .05 is used as the criterion of significance. There were no significant differences between any of the other variables.

"Economic status" is a variable which represents neither degree of knowledge nor source of knowledge, but which is nevertheless important. The percentage of individuals among the "moderate" and "comfortable" social groups who answered all three questions correctly was 26.8 per cent, while among the "poor" it was 15.7 per cent. There was no statistical difference between the two economic groups in the percentage of individuals who reported that information on cancer was received from "contact with the disease". About a third of both groups reported "contact with the disease" as a source of information. There was no statistical difference between the others and the "poor" group in respect to "visual aids", although the percentage for the "poor" was slightly greater (4.7 contrasted with 3.4 per cent). The higher economic groups had a significantly greater number of individuals exposed to the "spoken word" (32.4 contrasted with 25.2 per cent). The greatest difference between the two economic groups was in the knowledge obtained by reading. This was reported as a source of information in 66.8 per cent of the "moderate" group and only 43.5 per cent of the "poor" group.

Whether the findings of relative value in cancer education are applicable outside Massachusetts is not known. While multiple types of educational media have been used in the Massachusetts Cancer Program during its seventeen years of existence, during the past eight years emphasis has been placed on the "lecture", and the resulting newspaper report. "Visual aids" have seldom been used. This latter fact may account partially for the small number of individuals who obtained their information from "visual aids".

Contact with the disease, while very definitely an important source of information regarding cancer, cannot be considered one prompted by educational methods. The fact that so large a percentage of individuals obtained their information from personal contact with the disease is interesting.

The newspaper, while numerically reaching a larger number of people, only exerted an equal influence with the magazine. This was probably due to the fact that many newspaper items were merely notices of public meetings or clinics.

The magazine article has molded the opinion of large numbers of the population. Much of the credit for magazine articles on cancer should be given to the American Society for the Control of Cancer (16), although a study of the trend of the number of magazine articles recorded in the *Readers' Guide to Periodical Literature* (17) from 1900-1942 indicates that other factors were also important.

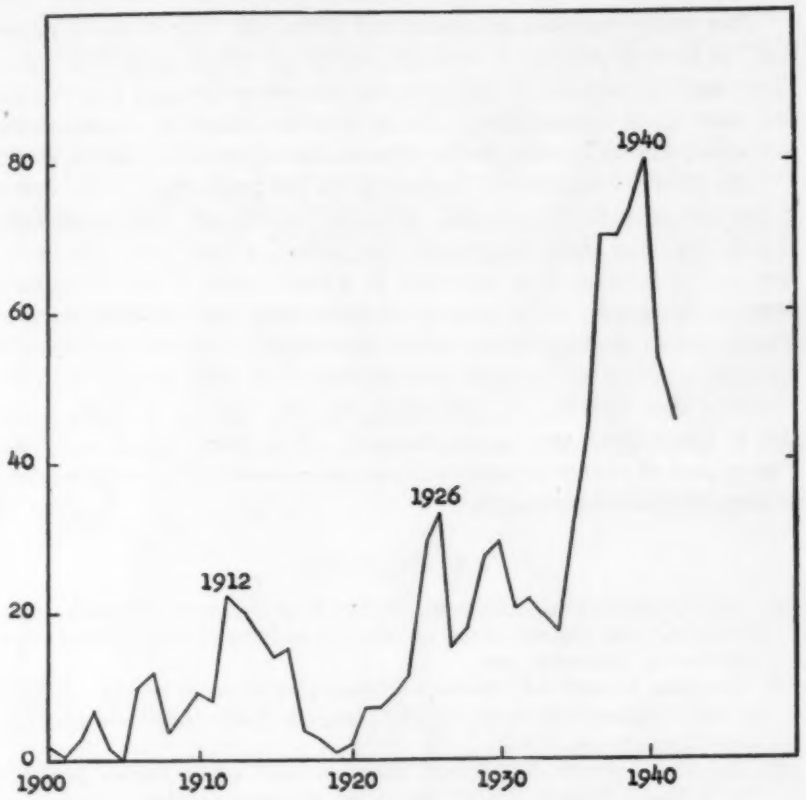

FIG. 1. NUMBER OF MAGAZINE ARTICLES ON CANCER RECORDED IN THE "READERS' GUIDE TO PERIODICAL LITERATURE" 1900-1942

While this trend has been consistently upward throughout the period, there have been three outstanding peaks (Fig. 1). The increase in the number of magazine articles on cancer in 1912 preceded by a few months the organization of the American Society for the Control

of Cancer on May 22, 1913 (18). The 1926 peak coincided with the inauguration of the Massachusetts Cancer Program (2), and the sharp rise between 1934 and 1940 was concurrent with the formation of six state cancer programs (3), the establishment of the cancer program of the United States Public Health Service (19), and the creation of the Women's Field Army of the American Society for the Control of Cancer (20).

This study furnishes measurements pertaining to medical information. It does not attempt to measure knowledge which motivates action. There may be considerable difference between the sources of information and motivating knowledge. The difficulties inherent in measuring motivating knowledge, up to the present, have prevented such a study.

The effort to disseminate knowledge to the public cannot be limited to any one educational medium. Multiple approaches reach more individuals than the single approach. In periods of national emergency, such as the present, it is necessary to curtail parts of the educational program in cancer. The scarcity of physicians and the difficulties of transportation prevent many public meetings. Limited budgets and personnel prevent as frequent contacts with the public as are desirable. There is also difficulty in procuring supplies, and as a result visual aids to the program may be unobtainable. It is gratifying to know that a large part of cancer education can be maintained through the medium of magazines and newspapers.

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THE STATURE OF TORONTO CHILDREN HALF A CENTURY AGO AND TODAY

BY HOWARD V. MEREDITH AND E. MATILDA MEREDITH
Iowa Child Welfare Research Station
University of Iowa,
Iowa City, Iowa.

PUBLISHED research on the physical growth of North American children includes two series of frequency distributions which are uniquely valuable for studying the difference in stature between the child of half a century ago and the child of today. It is the purpose of this note to bring these two series of distributions into juxtaposition and discover the magnitude of secular change they signify. Both series of distributions were compiled from stature measurements accumulated in extensive surveys on elementary school children made at Toronto, Canada. The older series represents data collected in 1892 (2); the newer series, data collected in 1939 (1).

The 1892 survey was planned by Dr. Franz Boas; endorsed by "Mr. James Hughes, superintendent of public schools in Toronto"; and carried out "under the supervision of Dr. Alexander F. Chamberlain" (2, p. 1541). Boas was responsible for the statistical reduction of the data. The 1939 survey was planned by Drs. F. F. Tisdall and J. H. Ebbs, endorsed by the Toronto boards of Education and Health, and executed under the supervision of Dr. Gordon P. Jackson, Dr. L. A. Pequegnat, and Miss Elsie Hickley. Responsibility for statistical analysis of the data was carried by Mr. N. Keyfitz.

In the 1892 survey, the subjects were almost exclusively of northwest European ancestry. Over 90 per cent were of English, Irish or Scotch lineage; the remainder included about 3 per cent of German descent and less than 1 per cent of French descent (2, p. 1599). In the 1939 survey, approximately 85 per cent of the subjects were of northwest European descent, 13 per cent of "Eastern or Slavic" Euro-

pean lineage, and the remainder of south European ancestry (1, p. 28-29).

Both studies were mass surveys of the children in attendance at Toronto elementary schools. The earlier study was limited to public schools, while the later included public and parochial schools. Occupational status of the parents appears to have been similar for the two studies. The 1892 sample was stated to include "very few children of the professional classes" (2, p. 1542); less than 5 per cent of the 1939 subjects were classified as representing the "professional" occupations (1, p. 22).

Stature was measured "without shoes" in both surveys. In each instance, the stature data accumulated were tabulated to form frequency

TABLE 1

Percentiles derived from stature data collected in **1892** *on elementary school children of Toronto, Canada*

MEAN AGE *(years)*	NUMBER OF CASES	PERCENTILES *(cm.)*				
		5	25	50	75	95
		Males				
6	481	100.5	105.6	109.2	112.0	116.6
7	771	105.4	110.6	114.0	117.0	121.9
8	879	110.3	115.6	119.1	122.7	128.2
9	924	115.4	120.4	123.9	127.5	133.2
10	865	118.9	124.7	128.7	132.5	138.4
11	847	123.7	129.8	133.7	138.0	143.6
12	757	126.7	133.2	137.6	141.8	148.4
13	703	130.6	137.5	142.1	147.0	155.1
14	504	134.5	142.1	147.6	153.4	162.4
		Females				
6	470	99.5	104.0	107.5	111.1	115.4
7	679	104.2	109.7	113.0	116.7	122.0
8	832	108.3	114.1	117.8	121.4	127.2
9	863	114.6	119.5	122.9	126.6	131.9
10	832	118.1	123.8	127.5	131.4	137.3
11	868	123.4	129.2	133.2	137.4	144.7
12	872	127.6	134.4	138.8	143.5	150.0
13	733	132.3	139.3	144.0	149.0	156.9
14	567	138.6	146.0	150.7	155.0	160.4

distributions at successive ages. Fortunately, both series of distributions were published. Over the age period from 5 years 6 months to 14 years 6 months, the reported analysis of the 1892 data afforded 36 consecutive "quarter-year" distributions for each sex (2, pp. 1557-1564); that of the 1939 data, 9 consecutive yearly distributions for each sex (1, p. 36). The latter distributions each represented "age to the nearest whole year" (1, p. 4), while the former could be readily combined—the first four quarter-year age groups being merged to form one annual age group, the next four to form a second annual age group and so fourth—to represent like ages. The 1892 distributions gave frequencies for one centimeter intervals; they were retained in this unit. The 1939

TABLE 2

Percentiles derived from stature data collected in **1930** *on elementary school children of Toronto, Canada*

MEAN AGE *(years)*	NUMBER OF CASES	PERCENTILES *(cm.)*				
		5	25	50	75	95
		Males				
6	3269	105.8	110.9	114.5	118.0	123.2
7	4080	111.1	116.3	120.1	124.0	130.0
8	4239	116.1	121.9	125.9	129.9	135.6
9	4451	121.4	127.2	131.3	135.3	141.2
10	4437	126.2	131.9	136.1	140.3	146.4
11	4470	130.1	136.2	140.6	145.2	151.9
12	4542	134.7	140.9	145.6	150.4	157.9
13	3869	139.1	145.3	150.5	155.8	164.6
14	2905	142.2	150.3	156.3	163.0	171.5
		Females				
6	3204	105.1	110.1	113.7	117.4	123.0
7	3794	110.5	115.9	119.5	123.3	129.0
8	4118	115.7	121.1	125.0	129.1	135.1
9	4510	120.8	126.2	130.4	134.6	140.7
10	4468	125.2	131.4	135.5	140.0	146.5
11	4342	129.9	136.6	141.4	146.2	153.6
12	4339	135.7	142.8	148.0	153.0	160.4
13	3790	140.8	148.2	153.1	157.8	164.5
14	2707	145.0	152.1	156.2	160.7	166.7

distributions gave frequencies in one inch classes; these were converted into metric system equivalents.

Having compiled stature distributions typifying each of 9 successive years of age on male and female children attending elementary schools in the City of Toronto 1892, it was possible to compute the five columns of percentile values shown in Table 1. Further, having available stature distributions comparable with the foregoing for age and sex on children attending elementary schools in the same city 1939, it was possible to compute the homologous columns of percentiles exhibited in Table 2. Table 1 will be seen to be based upon measurements of stature taken on a total of more than 13,000 children. For Table 2, the total number of subjects exceeds 71,000.

The values given in Tables 1 and 2 were used to derive Table 3. Table 3 presents the differences between corresponding percentiles for stature in 1892 and stature in 1939. Selected findings from Table 3 are as follows:

1. At age 6 years, the typical elementary school child of Toronto, Canada, was no less than 5.0 cm. (two inches) shorter in 1892 than in 1939. This shift upward with time is characteristic of the entire stature distribution for both males and females. There is registered a slightly greater increase for females than for males and for the upper half of each distribution than for the lower half.

2. At age 9 years, the typical child in attendance at Toronto elementary schools was approximately 7.5 cm. (three inches) shorter in 1892 than in 1939. Again, an upward displacement with time is registered throughout the stature distribution. At this age, the displacement is similar in magnitude for males and females. As at 6, 7 and 8 years, the secular increase is somewhat less marked in each sex toward the lower end of the distribution (6.0 cm. at the 5th percentile) and more marked toward the upper end (around 8.0 cm. at the 95th percentile).

3. The greatest differences between the 1892 distributions and the 1939 distributions are found at ages 12 or 13 years for females and 13 or 14 years for males. The typical Toronto schoolgirl aged 12 to 13 years was 9.0 cm. (three and one-half inches) taller in 1939 than in 1892. The typical Toronto schoolboy of age 14 was taller in 1939 than in 1892 by but slightly less than three and one-half inches.

4. In the case of females, the maximum divergence of the 1892 and 1939 percentiles is found at 12 years for the 75th and 95th per-

TABLE 3

Increase in stature (cm.) of Toronto school children between 1892 and 1939

MEAN AGE (years)	DIFFERENCE IN PERCENTILES (1939 values minus corresponding values for 1892)				
	5	25	50	75	95
		Males			
6	5.3	5.3	5.3	6.0	6.6
7	5.7	5.7	6.1	7.0	8.1
8	5.8	6.3	6.8	7.2	7.4
9	6.0	6.8	7.4	7.8	8.0
10	7.3	7.2	7.4	7.8	8.0
11	6.4	6.4	6.9	7.2	8.3
12	8.0	7.7	8.0	8.6	9.5
13	8.5	7.8	8.4	8.8	9.5
14	7.7	8.2	8.7	9.6	9.1
		Females			
6	5.6	6.1	6.2	6.3	7.6
7	6.3	6.2	6.5	6.6	7.0
8	7.4	7.0	7.2	7.7	7.9
9	6.2	6.7	7.5	8.0	8.8
10	7.1	7.6	8.0	8.6	9.2
11	6.5	7.4	8.2	8.8	8.9
12	8.1	8.4	9.2	9.5	10.4
13	8.5	8.9	9.1	8.8	7.6
14	6.4	6.1	5.5	5.7	6.3

centiles and at 13 years for the 5th and 25th percentiles. At 14 years (the oldest age studied), the difference between corresponding percentiles of the 1892 and 1939 distributions reduces to approximately 6.0 cm. This diminution in magnitude of difference following the adolescent acceleration is in harmony with findings for secular increase over the last half century as reported on college students and older adults.

It is pertinent to note that a third survey of Toronto elementary school children was made in 1923. A comparison of the 1923 and 1939 results has been published (1, pp. 10-15). It will suffice to add that

when referred to both the 1892 and 1939 results, the typical child of 1923 appears to have been roughly intermediate in stature.

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RECENT LITERATURE

USEFUL IN THE STUDY OF HUMAN BIOLOGY

In this department will be noticed the books and reprints which are currently received at the Editorial Office. Publications intended for notice here should be addressed to Dr. Lowell J. Reed, Editor of Human Biology, 615 North Wolfe Street, Baltimore-5, Maryland, U. S. A.

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